RAILWAY ENGINEERING
and Maintenance of Way

Published by the
BRUCE V. CRANDALL COMPANY, CHICAGO

BRUCE V. CRANDALL, President CHARLES S. MYERS, Vice-President
MAHAM H. HAIG, Managing Editor
O. W. BODLER, Secretary CHARLES A. BLAKE, Asst. Secretary
A. G. CALDWELL, Editor WARREN EDWARDS, Manager

Office of Publication: Room 510 Security Building Corner Madison St. and Fifth Ave., Chicago
Telephone, Main 3185.

Eastern Office: Room 714, 132 Nassau Street, New York City
Telephone, 3524 Beekman.

Cincinnati Office: 314 Mercantile Library Building
Telephone, Main 4216.

A Monthly Railway Journal

Devoted to the interests of railway engineering, maintenance of way, bridges and buildings.

Communications on any topic suitable to our columns are solicited.

Subscription price, $1.00 a year; to foreign countries, $1.50, free of postage. Single copies, 10 cents. Advertising rates given on application to the office, by mail or in person.

In remitting make all checks payable to the Bruce V. Crandall Company.

Papers should reach subscribers by the tenth of the month at the latest. Kindly notify us at once of any delay or failure to receive any issue and another copy will be very gladly sent.

Entered as Second-Class Matter April 13, 1905, at the Post Office at Chicago, Illinois, Under the Act of Congress of March 3, 1879.

VOL. II CHICAGO, NOVEMBER 1906 No. 11

AFTER much deliberation and considerable expense it looks as if the Panama Canal digging is to be turned over to private contract work. It is almost a recognized fact that private contract work is much less expensive than government work. Railroad men of any experience whatever will vouch for the cost of private contract work as against company work in ninety-nine cases out of a hundred. It is to be regretted that our goverment had not come to this conclusion before.

TRACK elevation work in Chicago, which is discussed more fully elsewhere in this issue, is in a well developed stage. While it is not at even the beginning of the end, the work looks to have at least a definite completion in the not far distant future. The record for the past year of 1905 shows a remarkable amount of work accomplished, all things considered. Few people realize the difficulties under which this work is carried on. In the majority of cases the tracks themselves have an exceedingly dense traffic not to mention the street over which the tracks are being elevated. A good many of the streets in addition to the heavy wagon traffic have a double line of street railway tracks. To carry the work of elevating hence requires excellent judgment to keep from delaying the involved traffic, as little as possible.

The work accomplished in 1905 shows fifteen miles of roadbeds and tracks, together with more than 129 miles of yard, switch and other tracks. Many of the well termed grade death-traps have been eliminated and taken as a whole, fifty-six grade crossings have been done away with. The amount of the expense during the last year was approximately $5,800,000, the railway companies bearing this without aid from the city. Employment was given by this work, directly or indirectly to 50,000 men.

Ordinances that are being passed from time to time by the city council are gradually providing for complete railway track elevation. When one considers that there are 23 different railroads running into Chicago, embodying the largest systems in the world, the elevation of the entire net work of tracks when completed, will present to the world a work of untold hardships and difficulties successfully overcome.

OVERHEAD bridge crossings are of small relative importance as compared with river bridges but are still worthy of considerable attention. In places where the traffic is at all dense the under blast action from the locomotive smoke stack is quite destructive. A number of roads seemed to have noticed this and have remedied the trouble, while others do not give the matter much thought. One of the latest types is the steel-incased-in-concrete bridge now under construction at Cedar Rapids, Ia. Where C avenue cuts across the railroad tracks of the Chicago & Northwestern, Chicago, Rock Island and Pacific Ry. and the Chicago, Milwaukee & St. Paul Ry. was originally a grade crossing. The city, however, has recently closed the crossing and has required the railway companies to erect a footbridge in its place. The bridge is a six span structure 341 feet c. to c. of end piers and its design has several interesting features. In the first place: (1) the steel trusses are entirely encased in concrete to protect them from the corrosive effects of smoke and gases from the locomotives; (2) the floor is a continuous slab carried by the bottom flanges of the trusses; (3) there are no expansion joints in the entire length of 341 ft. between abutments. The middle span is 31 ft. long with three 62 ft. spans on one side and two 62 ft. spans on the other. The trusses and posts are incased in a sheathing of ⅞ in. tongued and grooved planks, 6 in. wide, the planks being nailed to vertical posts fitted between the flanges of the trusses. As mentioned before the floor is a continuous concrete slab and with the horizontal steel bracing in the floor system, it forms a restrained concrete slab or transverse flat arch. The concrete floor is composed of 1 part Portland cement 2½ of sand and 5 of broken stone. For finish work a cement mortar 1 in. thick has been used of a 1:2 composition. It is reinforced by a sheet of wire netting resembling that commonly used in sheathing and laid close to the lower face of the slab. The netting of the

inside sheathing is carried down so as to be imbedded in the floor.

The especial attention that has been given to the protection of the steel even on this small structure goes to show that the matter is worth considering and more so because it is being constructed under the direct supervision of three of the largest railway systems in the country.

THE many new passenger stations that are now building or to be erected in a short time are hardly indicative of any great decline in passenger business. With the elegant Washington terminal in process of construction, the large new stations to be of the New York Central Lines and the Pennsylvania, Kansas City with her Union depot, and the proposed station of the Northwestern lines at Chicago, we have reached a period in passenger traffic of noteworthy success. A few points on the Northwestern depot may be of interest to our readers.

The old Wells St. station that this company now uses has been occupied since 1882 when they were handling about 4,000 people daily. Additions were made to the original building both in World's Fair year (1893) and 1898, which however did not relieve the congestion to any great extent. Today this depot attempts, it must be said attempts, for it will be found a pretty crowded place to handle 45,000 persons daily. During every twenty-four hours 304 trains are loaded and emptied. In 1905 the road carried over 24,000,000 persons.

For the last four or five years the company has been quietly acquiring right of way along Austin Ave., and through that section paralleling the Milwaukee division and along Clinton and Canal Sts. for the depot site itself. The arrangement in the new station will be particularly devoted to the question of handling local business in the most rapid manner.

The estimated cost of the new building while no definite plans or specifications have yet been drawn up, is in the neighborhood of $20,000,000.

OF RECENT interest in maintenance of way affairs are the discussions and papers brought out at the annual meeting of the Railway Signal Association held in Washington, D. C., Oct. 16 to 18. There has always been a slight mystery overhanging railway men not directly acquainted with the finer points as to the wiring in automatic block signaling when crossed by a foreign current as an electric railway. A committee composed of the following well known men in signal work submitted a set of specifications for approval by the association. W. H. Elliot, chairman; C. C. Anthony, Azel Ames, Jr., and C. C. Rosenberg. Under "methods of protection" against foreign current interfering with the working of automatic signals, the following conclusions were stated:

1. When there is a crossing of an electric road with a steam road, batteries must be placed at each end of the steam road tracks next to crossing and battery current arranged to flow in direction with the foreign current leading into track circuit, if foreign current is found to flow in a definite direction. The connections, through block section for control of signals, must be made by means of line wire circuits. If there is sufficient foreign current to destroy the proper working of the track relay when an insulated joint is broken down, the multiple track relay arrangement should be used.

2. For situations where there are power houses and foreign currents follow the track rails, although there may not be a crossing or connection with an electric road, it is recommended that the conditions be carefully studied and exact information obtained as to the source, direction, amount and pressure of foreign current, and provision should then be made for removing or blocking out this current.

3. To minimize as far as possible the effects of foreign currents on line wire currents, it is regarded as important that trunking be kept above the top of the ground, the rubber and other insulations be kept in first class condition and the common wire limited to a length of ten miles.

4. For multiple arrangement of track circuit relays, a resistance of 16 ohms is suggested for relay at battery end and 4 ohms for the relay at the other end of track circuit. The committee recommends that further research be made to establish the proper relation of the resistance, pick up and releasing point of the two relays of the multiple track circuit arrangement.

5. For track circuits having but one relay, a resistance of 9 ohms is recommended for circuits 500 ft. and under, and a resistance of 4 ohms for circuits of a greater length than 500 ft. While it is recognized that the best results are to be obtained by using a relay having a resistance proportioned to the resistance of the circuit, the benefits do not compensate for the disadvantage, from a maintenance standpoint, of having to keep in stock track relays of a number of different resistances.

6. It is advisable to thickly coat with a heavy oil the parts of an insulated joint before the joint is put in place. If there is interference from foreign current it is advisable to put a heavy oil on the joint and particularly around the exposed ends of the fiber at least every two months.

9. Trunking when run parallel with the tracks should be kept clear of the ground. When run across tracks, trunking should be put in with top clear of the ballast and with top of capping not less than ½ in. below the bottom of the rail.

10. The standard ground should be made by burying in moist an annealed copper plate 1-16 in. thick, two feet square, to which has been brazed for a length of 12 in., a No. 4 B. & S. gage soft drawn bare copper wire. The plate to be buried in clay or in a six-inch layer of fine charcoal and the connecting wire is not to exceed 150 ft. in length. The effectiveness of the ground should be tested by a Wheatstone bridge.

The thoroughness of these conclusions will no doubt be commended by signal men at large.

Track Elevation Progress in Chicago

SINCE the first ordinance passed by the city council of Chicago, in May of 1902, the amount of track elevation that has been completed has been enormous in its extent. An approximate estimate of the cost of the entire elevation as required runs in the neighborhood of $50,000,000. Up to April 6, 1905, $28,725,250 has been expended for concrete retaining walls, earth filling, labor, etc. The first ordinance, as stated above, was passed in 1902, requiring the Illinois Central Railway to elevate some 28 miles of track. This was completed the same year at a cost of $2,000,000, including some 13 subways or street openings under the track. Out of this ordinance there have resulted since, 69 ordinances calling for the elevation of 153 miles of right of way, including railroad yards.

Previous to the track elevation ordinances, retaining

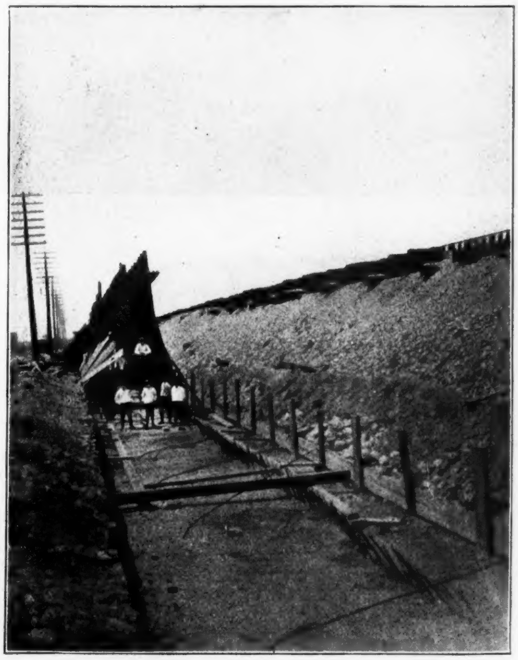


FIG. 1.

walls were built almost entirely with stone masonry. Since this work was begun, however, in a more systematic way, concrete has been the favorite with very few exceptions.

The accompanying illustrations give a very good idea of parts of the work under construction. Fig. 1 shows the concrete footings in place with the false work in the distance in which the retaining walls will be formed. The upper section of the wall is bonded to the footing by a line of iron rods which can be seen at the right projecting from the foundation. Fig. 2 gives a good idea of the formation of the false works on a rather high section of wall with a track and car above, loaded with concrete ready to be deposited in the wall.

One of the other methods of filling in the concrete will be seen by reference to Fig. 3. The outfit, as shown here is a concrete mixer mounted on a car combined with a boom and depositing bucket. The bucket receives the concrete directly from the discharge end of the mixer,

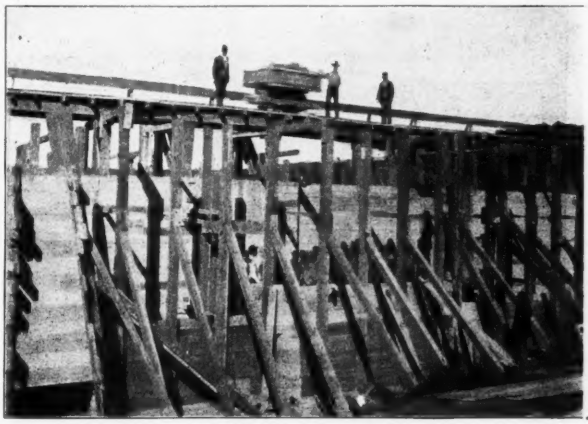


FIG. 2.

after which the bucket is elevated, the contents deposited in the form and later tamped. Fig. 4 shows the retaining walls completed. The tracks in the center are to be raised up with sand and gravel to the top of the walls. Here is where the trouble begins in elevating the tracks without materially impeding traffic. The usual

FIG. 3.

scheme is to concentrate the traffic on one or two tracks and then gradually elevate the others. After the tracks which have been raised, have become fairly firm, traffic is

FIG. 4.

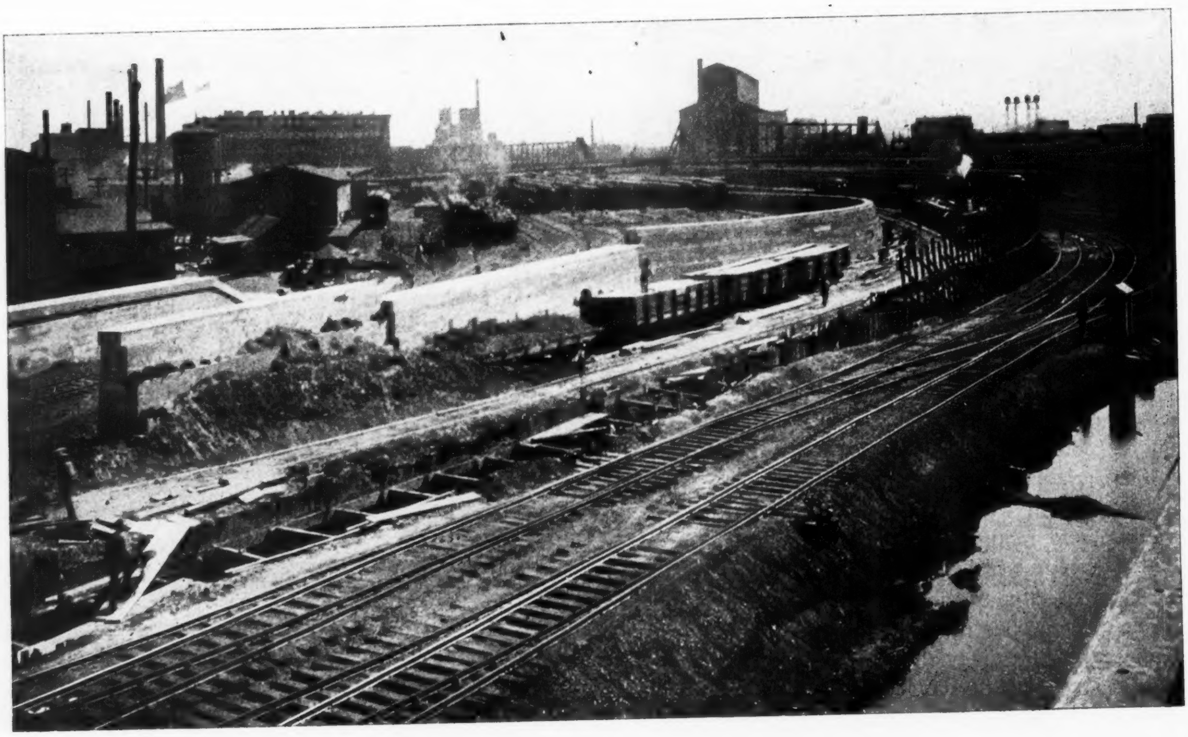


FIG. 5.

FIG. 6.

thrown over to them and the first section is raised. This operation is repeated until the work is completed.

Fig 5 is another view of a section of the track elevation work with one of the retaining walls finished and the forms in place for the other. At this point the amount of material required to fill in reaches to rather enormous figures. The right of way here varying from 100 to 200 ft. while the yards which will be noticed in the back ground, run out to a width of 400 ft., the walls being from 12 to 15 ft. high.

The work on the Pittsburg, Ft. Wayne and Chicago yards from 47th to 55th street required from 150 to 175 cars of sand daily from May 7, 1903 to April 6, 1905 after which the fill was only two-thirds completed. Fig. 6 shows the work being done in making this enormous fill.

Fig. 7 shows a concrete retaining wall on the Chicago and Northwestern Railway at Laflin street crossing.

In the Chicago and Northwestern elevation at Ashland and Western avenues, along Kinzie street, the works has been unavoidably slow. Three of the largest trunk lines of railroads enter the City and pass along and on Kinzie street to their respective depots. The combined traffic of these three roads is tremendous, a train passing either way every few seconds during the twenty-four hours of the day. Naturally this has a strong effect on the workmen, making them timid and extremely watchful to keep out of the way of passing trains and causing delay in the final completion of the work.

The following table gives evidence on what some of the roads running into Chicago expended in this work in the year 1905.

The work of the Chicago Junction Ry. or the Union

RAILROAD	DATE	WIDTH OF RIGHT OF WAY	NO. OF TRACKS	MAIN TRACKS	ALL TRACKS	SUBWAYS	ESTIMATED COST OF WORK DONE
P. H. W. & C. Ry........	1905	66 feet	4	2	8	8	$1,200,000.00
C. &. W. I. R. R.........	1905	400 feet	28	3	40	13	1,700,000,00
C. &. N. W. Ry..........	1905	60 feet	4	2.25	21.7	10	600,000.00
P. C. C. & St. L. Ry.....	1905	100 feet	7	2.50	13.35	9	1,100,000.00
C. M. & St. P. Ry.......	1905	1500 feet	40	2.50	37.88	5	600,000,00
C. J. Ry...............	1905	40 and 60 feet	3	2.65	8.25	11	600,000.00
		Total........	86	14.90	129.18	56	5,800,000.00

Stock Yard & Transit Company as shown by the above table during 1905, amounted to some $600,000. Eleven grade crossings were eliminated by temporary trestle work that took the trains off the street, also permitting the passing of street cars, teams and pedestrians underneath without interference. This work was considerably delayed by a strike of the structural iron workers.

On July 5th, 1905, an ordinance was prepared and presented to the City Council and referred to the Committee on Local Transportation. The substance of this ordinance was the requiring of the Chicago, Milwaukee & St. Paul Railway Company to elevate its roadbed and tracks from Graceland Avenue on the south to the City of Evanston on the north. The Chicago & North-

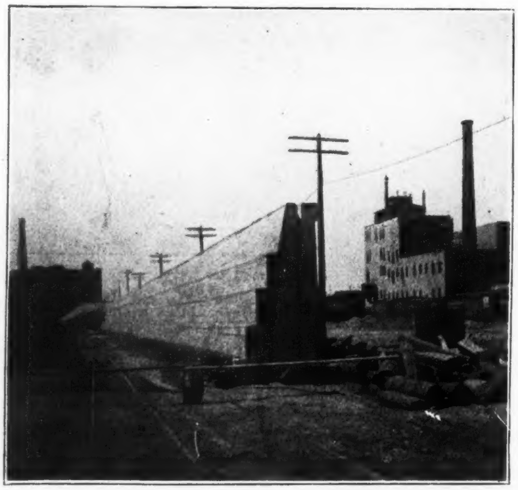


FIG. 7.

western Elevated Railroad was to have the use of these tracks for the above mentioned distance. In all the ordinance called for the elevation of about 5 miles of first main tracks and fifteen miles of all other tracks, eliminating 36 grade crossings by subways and diverting streets into subways, at an estimated cost of about $2,250,000.

The entire system of track elevation has in the main the aim of saving of human life and the protection of property in transit over the streets of Chicago. Again it enables the companies to increase the speed of trains and hence save time in leaving or entering the city. On behalf of the City of Chicago, the work has been carried on under the supervision of Mr. John O'Neill from the beginning. Too much cannot be said of his efficiency in this line of work.

It is stated that the Atchison, Topeka & Santa Fe Railway has commenced the planting of eucalyptus trees which will be used for ties and piles. The company has reserved a tract of 8,650 acres near Del Mar, Cal., for this purpose, and about 700 acres will be planted each year.

Convention of the Association of Superintendents of Bridges and Buildings

THE Superintendents of Bridges and Buildings held their sixteenth annual convention at the American House, Boston, Mass., Oct. 16-18 inclusive, with an attendance of 80 members. The session was opened with prayer by Mr. J. H. Cummin (member) who was followed by Mr. Lucius Tuttle, President of the Boston & Maine R. R., in an address of welcome, which contained some wise counsel to the association from one who has known much of the trials which confront the members in handling the technics of their profession. It was something new in the history of this body to be welcomed by a man so thoroughly in sympathy with their aims and purposes, instead of a municipal officer, and many members expressed the opinion that the idea would work out well with other railway associations.

Of the seven special committees due to report, but four were ready. One of these, that on Concrete Bridges, Arches and Subways, was exceptionally well treated, and it was plain in the discussion that the opinions of the members were distinctly favorable to concrete for the purposes named in the paper, and also that concrete construction was simply in its swaddling clothes for railroad work at this time.

It was developed that concrete was especially valuable for railroad work for the reason that cold weather had no effect on its setting other than to take a little longer time than in summer. Mr. Reid of the Lake Shore road gave it as his experience that on his road where stone is easily obtained, concrete is a cheaper construction that masonry, and has the advantage that it can be used where it would be impossible to use stone for want of facilities or time to handle the latter. There were some decidedly favorable views expressed on the reinforcement of concrete when that subject was discussed.

Some interesting information was given by members who had been present at the driving of concrete piles of the Simplex Concrete Piling Co., for a freight house at Boston. These piles were two hundred in number and driven to a depth of thirty feet. The performance was of such an exceptional character as to be worthy of more than passing note.

A subject closely akin to the above was in the form of a printed report on Pile and Frame Trestle Bridges. In the discussion of this report, Mr. Cummins of the Long Island road showed a section of a cresoted pile that had been over twenty years in Jamaica Bay and was as sound as the day it was driven. As an object lesson in untreated piling, the same member presented a section of a plain wooden pile which had seen service near the concrete specimen. The untreated pile was not only in a bad condition from natural causes, but was honeycombed by the ravage of the Teredo.

In the discussion of Preservatives for Woods and Metals, it was said that corbolineum was very efficient in the prevention of external decay. It was the consensus of opinion of the members that the use of any oil would

tend to prolong the life of timber. Mr. J. F. Parker of the Santa Fe, stated that his road had used crude oil very largely and with excellent results, on all trestles and wooden bridges, resulting in less sun checking and a longer life to the structures.

The intense interest taken in concrete construction is evidenced in the list of subjects for the ensuing year. Among these are:

Concrete Bridges, Arches and Subways, continued; Concrete Building Construction; Expansion and Contraction of Long Concrete Walls, Either Reinforced or Plain Concrete; Action of Sea Water on Concrete; (a) Made in Air and Sunk in Sea Water; (b) Concrete Deposited Direct in Sea Water. In addition to these subjects are: Wooden and Asbestos Smoke Jacks for Engine Houses; Combination Fastenings and Locks for Rolling and Sliding Doors on Freight Houses and Other Buildings; Construction of Tower and Guides for Lights on Drawbridges; Protecting Steel Railroad Bridges Against the Action of Salt Brine from Refrigerator Cars.

The officers elected for 1907 are as follows: President, J. H. Markley, T. P. & W.; First Vice President, R. H. Reid, L. S. & M. S.; Second Vice President, J. P. Canty, B. & M.; Third Vice President, H. Rittinghouse, Wis. Cent.; Fourth Vice President, F. E. Schall, L. V.; Secretary, S. F. Patterson, B. & M.; Treasurer, C. P. Austin, B. & M.; Members of the Executive Committee, W. O. Eggleston, Erie; A. E. Killam, Intercolonial; J. S. Lemond, Southern; C. W. Richey, Penn.; B. J. Sweatt, C. & N. W.; H. H. Eggleston, C. & A. It was voted to go to Salt Lake City for the 1907 meeting.

The supply fraternity had a stronger representation of roofing materials than usual and comprised in this case nearly the whole of the exhibits as will be noted from the following:

Joseph Dixon Crucible Co., Jersey City—Silica Graphite Paint.

Fairbanks, Morse & Co., Chicago, Inspection Cars, Jacks, etc.

F. W. Bird & Son, East Walpole, Mass., Paroid Roofing.

American Hoist & Derrick Co., St. Paul, Photos of Hoists.

A. O. Norton, Boston, Ball-bearing Jacks.

The Lehon Co., Chicago, "Roofrite" roofing.

Ideal Concrete Machine Co., South Bend, Ind.

Eastern Granite Roofing Co., New York.

Philip Carey Mfg. Co., New York, Flexible roofing.

J. A. & W. Bird & Co., Boston, Rex Flintkote roofing.

McCord & Co., New York, Gibraltar bumping post.

H. W. Johns-Manville Co., New York, Asbestos roofing.

Paul Dickinson, Inc., Chicago, cast iron smoke jacks.

Barrett Mfg. Co., New York, Pitch and coal tar felt.

Standard Paint Co., New York, Ruberoid roofing.

American Track Barrow, Lowell, Mass.

United States Graphite Co., Saginaw, Mich.

Fundamental Features of Railroad Yards

RAILWAY yards, both as to terminal and divisional work present one of the greatest problems in the railroad world today. Their good or bad facilities for the handling of traffic have considerable to do with not only the reputation of the road itself but the entire community whose needs it supplies.

The great trouble is that most of our larger yards have been built up piece by piece and hence we find a lack of continuous or well connected car handling. This is fully realized by the officials in charge but in many cases the layout is the best possible under the existing local conditions. How often we read of the severe criticism of some particular yard by the able and experienced "so and so," accompanied perhaps by statictics to prove his point. The local governing conditions have been entirely overlooked however and to be candid his criticism is useless. An idea of the fundamentals and purposes of a yard may serve to show the many possible chances for error in yard layout.

A yard has been defined as "a system of tracks arranged in series, within defined limits, provided for separating and making up trains, storing cars, and other purposes. Movements not authorized by time tables or by train orders may be made over these tracks, subject to prescribed signals and regulations."

Intervals between yards are dependent for the most part on the volume of the traffic, running usually from 100 to 200 miles apart. The principle purpose of the railroad yard is to handle the freight. Facilities are of course provided at suitable points for passenger train service, where trains are made up and handled. This passenger business is of relatively small importance as compared with the need for handling freight trains. The railway freight yard at the divisional points receives trains both through and local, separating and classifying where necessary and puts them into trains for forwarding. The yards' efficiency is dependent upon the minimum time in which this shifting can be done. Through freight trains require little attention outside of changing engines and cabooses, watering and caring for stock if any, and icing refrigerator cars under the same condition. But general or local freight trains require considerable rearrangement and switching. Their make-up includes perhaps many different classes of commodities for many different points. A yard of any considerable size has generally a number of local trains running either way out of its boundaries. These trains that pick up cars in territory tributary to the yard re-

quire the largest amount of switching that is done. Then too the track grades play an important part as a heavy train coming into the yard may have to be broken up to come within the tonnage rating further along. Many yards merely provide for the redistribution of cars in trains, for forwarding over the next division or for interchange with foreign roads. At terminals and large cities, the yards generally include the handling of cars to and from freight houses, warehouses, team tracks, factories and industrial establishments, coal and stock yards, and ore docks or piers. Again it is necessary to return the cars after their having been unloaded at these various places.

In yards of any extent, the portions or parts composing are also termed yards as receiving, separating, classification, storage, repair, advance and departure yards. Each yard is entered or left by a "lead" or "ladder" track which is connected to each track. The size and number of the tracks in each yard is variable depending upon the length and frequency of the trains or more properly speaking, what the railway officials a number of years before, thought they would be. As has been said before the greatest efficiency lies in the least switching necessary and in a constant direction of the cars. There is therefore two general divisions as an east and west bound or a north and south bound yards. Special provision must be made for perishable freight, live stock, etc., so that fast-freight trains can be made up rapidly and without interfering with the regular switching movements in the yard.

Let us follow the handling of a freight train upon entering a fair sized yard. It first enters the receiving yard, where the caboose and engine are detached, the work of sorting the cars being taken in hand by a switching engine and crew. The cars are first inspected as to their physical condition. Those that are in good traveling condition are marked as to their disposal which may include one of the following: (1) sent on in through trains over the next division or over some connecting road; (2) distribution to stations along the next division by way of local freight trains; (3) unloading at the yard; (4) distribution to local freight houses, factories, grain elevators, coal yards, etc. If, however, the cars are not in good running order they are set out and held for repairs.

Continuing with our cars marked for disposal, they are next sent to the separating yard where cars containing the same commodities as grain, coal, lumber, etc., or cars destined for the same point are lined up on the same tracks. From the separating yards the cars are switched to the classification yard. Here the cars are classified either as to their contents or as to districts. The cars are then drawn to the departure yard in cuts or strings to form trains ready to proceed over the road.

Cars without air are always delegated to the rear of the train so as to allow the engine to be connected with air as far back as possible.

At the first glance at the question of length of tracks in a yard it would seem that they should be capable of holding the maximum trains that are run over that division. On looking a little more closely at the situation this question becomes much more complicated. There is the ever governing condition of the shape of the ground whether long and narrow or short and broad. Then, too, if the maximum trains are relatively few it is not of any especial advantage to have the longer track. The most logical conclusion is then for a general working plan is to have the tracks capable of holding average trains allowing the few maximum trains to be split up.

What is known as the "teaming" yard is naturally of more importance in a terminal than in a division yard. The best location is generally as near as possible to the freight yard. To facilitate the easy movement of wagons, it should be paved. For convenience in switching the tracks should be short, holding from 15 to 20 cars and are arranged in pairs with the paved driveways between the pairs.

A storage yard of any considerable size is highly valuable, this being the place where cars are held awaiting orders. When possible the storage yard should be accessible at both ends by the ordinary ladder or lead tracks, otherwise there is considerable time lost in switching out cars in the rear.

For our repair yard the tracks to permit of convenience in removing cars when yards should again be short, holding, say from twelve to fifteen cars. They are generally arranged in pairs spaced 16 ft. and 40 ft. alternately between centers. A narrow gauge track for conveying material may be laid in the 40 ft. spaces. A separate yard for light repair work will be found very useful and saving of time over the usual delay in ordinary repair yards.

There is always a tendency to neglect the maintenance of a yard for main line work. A good deal of later trouble can always be avoided by proper drainage and ballasting at the start. Heavy rails are almost a necessity in yards where the traffic is at all congested. When possible the scales and scale track should be in line between the receiving and classification yards.

For night yard work the lighting is generally a difficult problem and it is usually solved by having no lights at all. Electricity is the most practical method. When this is used great care must be taken to avoid shadows so that tall poles are necessary. Another important point in yards of any size is the connection of the main yard office to the dispatchers office and outlying offices by telephone or telegraph.

The main line tracks should, if possible, run around one or both sides of the yard. Safety demands that the yard connections to the main line be very limited and one at each end of the yard will be found sufficient. These connections should in all cases be carefully guarded either by an interlocking system or watchman. Within the yard the operation of the switches is generally by hand though the movement can be greatly facilitated with a properly arranged yard by compressed air and electricity. This would not be true in the case of the

built up yard that has been previously mentioned. The unwielding "stringing out" of the switches in the built up yard prevents as a rule their being handled economically from one tower.

The switching of cars is effected by three different methods at the present day.

First—Rear end or tail switching, being the ordinary method of bumping the cars or cuts. Second—Poling, where the engine runs on a track parallel to the cars pushing the car by means of a pole fastened to the engine and swinging out and against the car. Third—Gravity switching, where there is sufficient grade on the ladder to keep them moving down into the yard or where the cars are pushed up to a "hump" and drop off on the other side of their own weight.

The complete classification of cars into district and station order, by gravity, in one operation, was first adopted in 1873, by Mr. Footner, for the extensive Edge Hill yards of the London & Northwestern Ry., near Liverpool, England. The main part of the yard is on sloping ground and the cars delivered at the upper end drop down through the separating and classification yards, by gravity. They are by this means, together with the correct throwing of switches delivered in proper train order to the departure yard. Two classifications yards immediately preceed the departure yard so that cars are in shape for immediate departure on their arrival in the final yard.

For freight traffic the buildings immediately necessary are those for unloading inbound freight and those for loading outbound. Driveways are made for teams on one side as a rule, but in some cases, if the car tracks run inside of the house, they may be located on both sides. For inbound freight the houses are generally larger than the outbound, or perhaps, of a different shape. The inbound freight house should have a good depth for storing freight, say fifty ft. while the outbound house should be longer and narrower, in order to decrease the amount of trucking. Twenty-five feet is considered a good width. Accommodations in the way of a building should also be made for transfer freight.

Passenger cars and trains require little switching, except at terminals, where trains are made or broken up. Tracks are usually set aside, known as a passenger car yard, for storing, handling and cleaning cars. When possible, a turntable should be arranged for independent of the round house turntable, for turning cars and a V-track for turning whole trains. Tracks are also assigned for dining, sleeping, parlor and other special classes of cars. The car cleaning yard should be paved and is generally supplied with air and gas pipes, steam, water. The pipes are laid as a rule between the pairs of tracks.

For operating purposes, roads are generally divided into districts of 100 to 200 miles in length. Each district has its own locomotive equipment and facilities for cleaning and storing them. After the engine has finished its run, it is cut off from the train and run upon a special track, where it is inspected. From the inspection track the engine moves to the ashpit where the grates and ashpan are cleaned. It then coals, takes water and sand and is run into the round house. Here light repairs are made, all cleaning necessary is performed and is held until needed for a new trip. In a good many cases where the motive power is in considerable demand, the engine is taken care of outside of the round house, to save time.

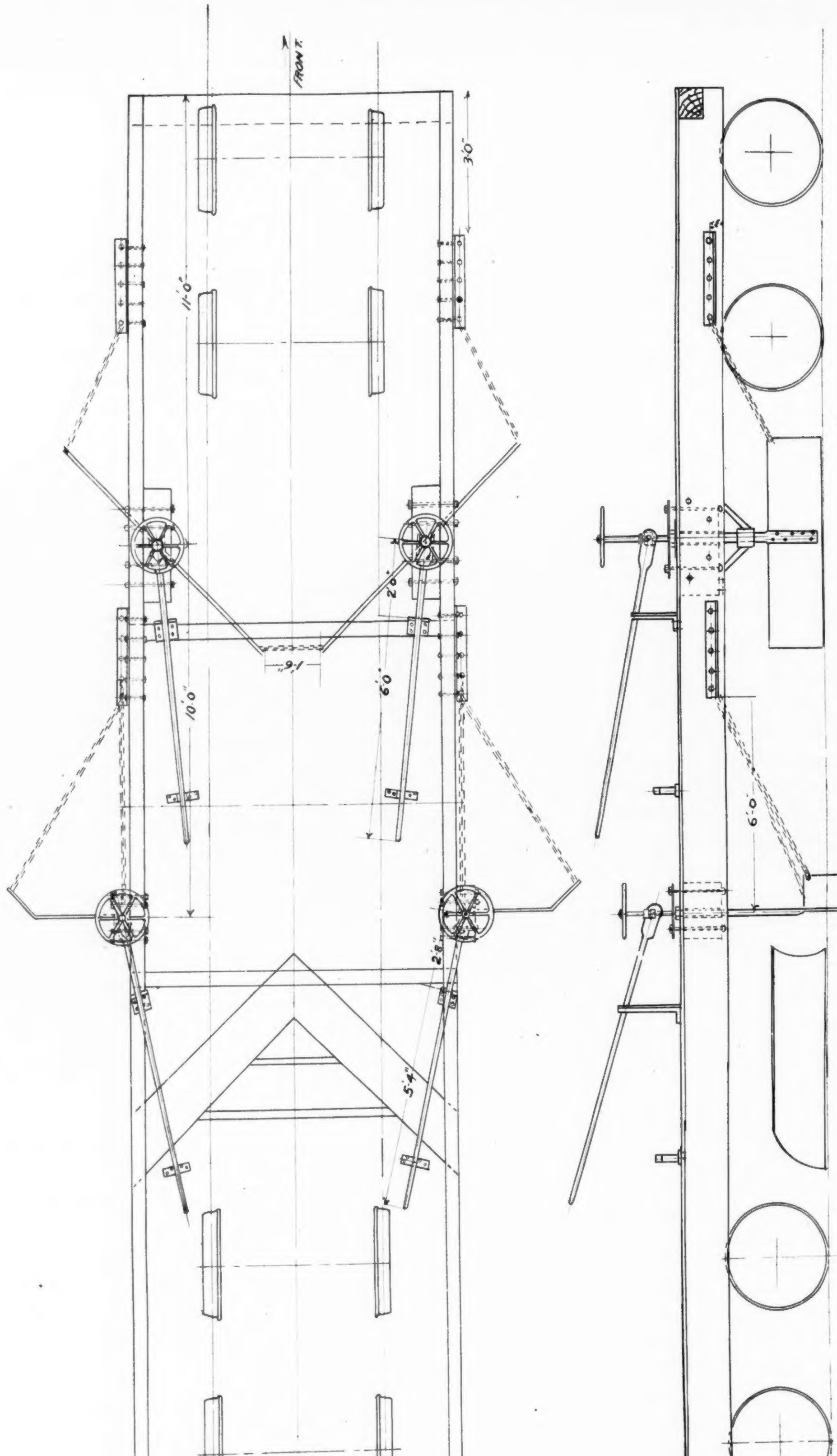
The caboose of a freight train is also changed at the same point as an engine and is immediately set aside on the caboose track after its arrival in the yard. An especially good arrangement for the caboose track at each end of the yard is to have a slight assisting grade so that the caboose can be dropped down by gravity to the rear of the outgoing return train.

After this brief outline of the arrangement and workings of passenger and freight yards the difficulty in getting out a design suitable to all conditions, will be readily seen.

As THE cold weather is slowly but steadily coming on, the track men will soon be taken off of new work to put the roadbed in shape for the winter. The disposal of a section foreman's work to the best advantage is always a difficult performance. In reality a good section foreman is more or less an engineer, in that he seeks to so direct the work of his men to gain the maximum efficiency at the least cost. On account of the many different conditions found in railway track work, it is next to impossible to make any hard and fast rules as to the schedule of fall works. This is true, with one exception, that the roadbed needs the best possible drainage. To accomplish this the ditches require close attention, as to their freedom from obstruction and sufficient fall to drain readily. Where tile is known to have been laid it should be uncovered to note any obstruction or breaks in the tile itself. Of course, all this takes time, it will be said, but the old adage is never more true than in roadbed drainage, "An ounce of prevention is worth a pound of cure."

Roadmasters' and Maintenance of Way Convention.

The 24th annual convention of the Association will be held in Chicago, Ill., on Nov. 13, 14 and 15. The headquarters will be at the Sherman House, corner Clark and Randolph streets. There are six standing committees which will report on subjects which are of particular interest, as follows: Best Method of Maintaining Track for the Tonnage and Speed of Today; What Can be Done to Induce Young Men to Enter the Track Service and Remain Long Enough to Enable Them to Take Charge of Track as Foremen; Wood, Metal and Combination Ties—Preservation of Ties; Tie Plates; Spreading of Rails; New and Improved Appliances for Use of Maintenance of Way.



PLAN AND SIDE ELEVATION OF THE LAAS BALLAST PLACING CAR—C. M. & ST. P. RY.

Ballast Work on C. M. & St. P. Ry.

ONE of the most ingenious as well as effective devices now being used in ballasting for track work is that in use on the C. M. & St. P. Ry. the idea having been given by Mr. E. Laas, Engr. M. of W. During the present year the car has been in operation on the Southern Minnesota Division and has been found to be quite a money saver. As compared with the customary method of dumping ballast off the end of the car and then shoveling by hand over to the track, it easily saves over a hundred dollars per mile.

By glancing at the side elevation of the car the blade shown to the right of the center will be noted as pivoted on a center axis, which may be adjusted by a wheel from the floor of the car. The view as given shows the lever which drops or lifts the pivot and blade in position for work. When not working the end of the lever to the left is depressed and is held down in a receiving socket shown directly underneath. The portion of the pivot or axis for the blade that runs through the opening in the car floor, when not in use is boxed to prevent accumulation of grit and dirt on the surface. This reach of the pivot that has just been spoken of is very smoothly bored to allow of easy turning of the blade beneath. When the car is being moved toward the right as the arrow on the plan indicates, the blade is turned out so as to catch the ballast previously dumped at the end of the ties and divert it towards the center of the track. A chain will be seen attached to the upper right hand corner of the blade and running to an angle bar secured to the side of the car. The chain is run through a hole in the angle bar and the adjustment for the proper length of the distance between angle bar and blade by a large hook on the hand which is caught in the link desired. As this blade is liable to leave things a little unsettled perhaps in the heaping up of ballast in the center of the track or leaving some on the rails, another device has been placed on the same car to correct this trouble. On the left of the car and underneath a double blade or rather center plow is set to divert the ballast and level it off to the proper requirements. This plow is so arranged as to scrape the rails.

The combination of the center pivoted blade and the center plow arranged as shown in the accompanying illustrations has proved to be a most successful one.

In most cars of this general type the trouble has generally been with either a lack of practical shape or adjustments or a successful combination of the two.

In addition to the above mentioned arrangement the car also carries a shoulder forming blade. Its adjustment to the car is much the same as the first blade mentioned. The turning or pivot bar is, however, in this case attached to the inner side of the shouldering blade. It is turned by means of the wheel from the floor of the car and either lifted or dropped into working position by the lever arrangement also used in the front end of the car. An excellent idea of the working of this blade can be noted by reference to one of the accompanying illustrations. On account of the great pressure on this blade from its action taking place so far out to the side it was necessary to construct this of rather heavy material. In addition the blade is held against turning by two sets of chains, one at the top of the outer side and the other an the inner side as a brace to the pivot bar. This shouldering blade is also a great time and money saver. The height of this blade as originally made was found to be too low for practical purposes. When a pile of ballast was struck as the car moved along, it seemed to stack up in front of the blade and run over the top, this was of course a fault easily remedied.

The car with the accompanying blades and plow was

LAAS BALLAST PLACING CAR, C. M. & ST. P. RY.—FIRST BLADE IN ACTION

LAAS BALLAST PLACING CAR, C. M. & ST. P. RY.—BALLAST SHOULDERING BLADE IN ACTION.

made at the West Milwaukee shops of the C. M. & St. P. The idea of the arrangement was given by Mr. E. Laas, Engr. M. of W. to Mr. J. F. DeVoy, Mechanical Engineer for the road, who designed the mechanical details and workings.

*Practicability and Life of Metal Cross Ties for Railroad Track Construction

By Mr. H. T. Porter.

Chief Engineer, B. & L. E. R. R. Co.

I WAS requested to present a paper on the practicability and life of metal cross ties for railroad track construction. I have not been able to prepare an article on as broad lines as the title calls for, but have only endeavored to present in a simple way the experience of the writer with metal cross ties.

There is an ever pressing demand for the reduction of cost and an increase in speed and safety of transportation.

It is causing, from year to year, radical changes in the character of equipment and of the roads on which the equipment runs.

For the improvement of the roads, grades are being reduced, curves are being lightened, or eliminated, and in every practical way the roadbed and track are being made more substantial.

In order to provide a more stable support for the track, they are providing wider and better drained roadbeds.

To secure a ballast of better supporting power, crushed rock of various kinds and of various sizes, gravel with various percentages of sand, and other natural and artificial ballast material are being tested.

To distribute the load and lower the unit of pressure on the ballast, rails of larger section are continually replacing those of smaller section.

Why is this? Because within the last 25 years the load per axle of car has increased from 12,000 to 36,000 pounds, of locomotives from 20,000 to 60,000 pounds, and in a few cases the axle load of cars has reached a much higher figure.

This increase in load, together with the increase in speed, has increased the demands upon the track from four to five times.

In the construction of the road, you note the improvement of the roadbed by making it wider and more stable by careful drainage, of the ballast by the use of better quality of selected material, of the rail by the use of larger sections.

Has there been any such corresponding improvement in ties?

I believe that any observer of new construction in the eastern section of this country will note that quite a percentage of ties are now being used which would have been rejected a few years ago as not being up to specifications either as to quality or size.

This, as is well understood, is due to the rapidly diminishing quantity of available tie timber, and a corresponding increase in the use of ties.

The short life of wood and the limited conditions under which it can be used have led to the use of steel in bridges.

For similar reasons steel freight cars are taking the place of wooden freight cars as fast as the car companies can produce them.

The era of steel coach equipment is rapidly opening, and it is the opioion of many that the substitution of steel passenger equipment may soon attain the same rate of progress as that of freight equipment.

You will note that the improvement in track has been in the roadbed and ballast under the ties, and in the rail over the ties, whereas the character of the ties is either no better or worse than it was years ago, when the work of the track was only about one-fourth of what it is now. The necessity for an improvement in the ties is undisputed, and the only question is, what direction shall it take? Shall the improvement come as it has done in bridges and in freight and passenger equipment, by the use of steel?

As bearing on this question, the writer will try in a simple way to state his experience in the use of steel ties.

During the fall of 1900 there was furnished to the Bessemer & Lake Erie Railroad about 1,100 steel ties, these were the Carnegie M-14 Trough section. During November and December about 750 intermediate ties were placed south of Osgood in a piece of 100 pound rail track where the alignment was a compound curve of 6° 30′ reducing to 3° 30′ followed by a 9° reverse curve. During the following March and April after the slotted angle bars were received, the joint ties were put in. The track was then ballasted in the usual manner with furnace slag. About one-half of these had an angle riveted on the under side at the center of tie, and the balance had an angle riveted on the under side just outside of each rail. The object of the angle was to hold the track in line. They caused some inconvenience in the final lining of the track after it was surfaced. At the time the ties were put in all trains ran over this track, but after May 1, 1902, southbound ore trains and a portion of northbound freight were handled over a new line running to the east, but the rest of the trains continued the use of this track. Trains were operated over the 9° curve about four years without resurfacing. On account of the soft roadbed portions of the compound curve did not run so long. These ties are still in and are giving good service, but are not as satisfactory as those used since.

During September, 1904, there were received about 1,200 Carnegie I beam steel ties. During November and December, 1904, and January, 1905, 1,000 of these were put in the track about two miles north of Euclid station, where the track was laid with 100 pound rails on white oak ties about six years old and ballasted with

*From a paper read before the Railway Club of Pittsburgh, by Mr. H. T. Porter.

six or eight inches of slag. The ties were put in by the regular section gang and without any special provision for placing track in better condition than it was before. Additional ballast was not furnished, and as the space occupied by the steel ties was so much smaller than that occupied by the wooden ties, there was not sufficient ballast to half fill the track. Between November, 1904, and June, 1905, the road at this point was single track, and carried the entire tonnage of the B. & L. E. R. R. On this section southbound trains are assisted by pushers, and during a portion of the time pushers with 180,000 pounds on the drivers were used. After June, 1905, southbound traffic has been handled over these ties. The Supervisor reports that after the steel ties were put in on this curve he had much less trouble in keeping the track in line than he did before, notwithstanding it was hardly half filled with ballast. Considering that from November to June the pushers were backing up around this curve that this track held its line is very significant, the cause for which I have attempted to explain later.

Since then we have received 105,000 of these ties, about 70,000 of which have been placed in the track, to give them a thorough test under conditions existing on the B. & L. E. R. R.

Substantially all the freight of this road is handled on that part of the line between Conneaut Harbor and North Bessemer, which is 146 miles in length. The freight tonnage is about 10,000,000 net tons per annum, with an average haul of about 120 miles; the line crosses eight watersheds and as southbound 30 foot grades and over are operated with pushers, it has seven pusher districts, covering about 33 per cent of the road. The curves generally are from three to four degrees, though there are a number running from six to eight degrees. On the north 15 miles of this line engines with 225,000 pounds on the drivers and south of this engines with 160,000 and 180,000 pounds on the drivers are used in handling freight trains. As about 8,000,000 tons of freight is ore and coal, loaded so that the gross weight of car load runs from 136,000 to 144,000 pounds per car, producing a load of 34,000 to 36,000 pounds on the axle, and as 60 per cent of this line is still single track, you will note that the service is very severe.

This year we have made two changes in line, one a half-mile long and the other three and one-half miles long. In this work and on all second track work we use steel ties. On a portion of this work the track was laid with steel ties acoss a creek bottom and blocked up, and afterwards raised to grade by running onto it filling in 80,000 to 100,000 pounds capacity cars, loaded to their full capacity, which was unloaded and used in raising the track. We are using these ties in new work under all conditions where wooden ties have been used, and find that, taking everything into consideration, it can be done with the same facility and convenience as with wooden ties. In maintenance work either steel or wooden ties, which ever happens to be on hand, are distributed. Steel ties are used in renewing, whether there be one, two or more ties in a place to be renewed, that is, they are used in the main tracks under all conditions where wooden ties have been used.

The wooden tie track in most general use in this country consists of timber ties laid at right angles to the center line at regular intervals, and of two rails running parallel with the center line, resting on the ties and secured thereto with track spikes. The spikes may be driven home from time to time, but they do not so remain, but lift up to a less or greater degree depending on the solidity of the track, so that the primary function of the spike is to keep the rail from moving latterly. Within the limits of ordinary vertical movement the rail is held down on the tie by gravity or the weight of the rail and its load. As a general rule, there is, though it be small, more or less play between the base of the rail and the spike. This is to explain that on account of this play, there is a lack of firm and intimate connection between the rail and ties through the spike, between adjoining ties through the rail, and between the two rails through the ties. On account of this lack of firm and intimate connection, the vertical forces of the load on the rail are not instantly distributed to the adjoining ties, nor are the latteral forces instantly distributed to the other rail and adjoining ties. The vertical load is conveyed to adjoining ties in succession, and the latteral forces or blows are only resisted by the latteral stiffness of one rail until the single rail has moved the amount of the play in the connection between the rails and ties, thereby allowing a movement which aggravates the latteral blows or forces. A rigid connection between the rail and tie will certainly assist in bringing the load and in distributing the latteral blows and forces to both rails and adjacent ties.

The joints or connections are the feature in which the steel cars and bridges to the greatest degree excel wooden ones, and in an all metal track construction you can obtain a superior connection between rail and tie.

In an all metal track you obtain not only the instantaneous resistance of both rails and adjoining ties to latteral blows or forces, but you have the friction between rail and tie made by the fastening in the joints in advance of and following those on which the load directly rests.

This rigidity in the track structure itself independent of the ballast accounts for the track on the 4° curve, where steel ties were laid in the fall of 1904, remaining in line without being filled and provided with a shoulder of ballast.

We have observed where steel ties are used that we obtain less wear and a more uniform wear of rails. This is accounted for by the better fastening, securing a better connection between rail and tie, preventing the rail from rolling and producing a latteral rigidity in the track structure independent of the ballast.

In putting up track it is first surfaced and then lined, the operation being repeated until the surface and line are satisfactory, when it is trimmed. No feasible track construction, as far as I know, has yet been devised where the track under heavy load and dense traffic will

permanently remain in surface and line, and as surfacing and lining have to be repeated periodically, the design of the tie should be such as to make it adapted to this operation. The wooden tie with parallel top and bottom faces is well adapted, as you can line it within reasonable limits without throwing the track out of surface; the only ballast which prevents lining is that at the end, which can readily be removed and replaced when lining is completed. The failure to recognize that the form of the tie should be such that the track can be lined without throwing it out of surface has made numerous designs otherwise good not practicable for use. This brings up to the conclusion that a tie with straight sides in general, with distortions to resist movement in ballast, so located that the ballast obstructing the movement can readily be removed before and after the lining has been done.

The life of wood white oak ties under heavy traffic ranges from four years on sharp curves to eight or ten years on tangents. There is a wide difference in the durability of timber, even when it is the same kind taken from the same pack of woods. It is beyond the ability of inspector or trackman to select ties that will give the same duration of service. The tie begins to deteriorate from the time it is put in place, the rate of deterioration increasing until it becomes necessary to remove the tie. There is no track work that compensates fully for this deterioration, so you cannot maintain a condition equal to an all new tie track.

The steel tie maintains its section and the bed under the tie does not have to be disturbed on account of tie becoming soft, nor on account of the effective thickness of the tie becoming less due to rail or tie plate bedding into the tie. The steel tie up to failure retains the same dimensions and efficiency, reducing the work required for surfacing the lining, and it is possible throughout the life of the tie to maintain track of the same excellence as with all new ties. Up to the present time we have only had one broken rail on steel ties and the report attributes this break to a flaw in the rail.

We have not used steel ties long enough to determine their life under our conditions, but an examination of a broken tie after six years' service does not indicate that rusting under ordinary conditions should cause any anxiety. I somewhere read a statement that Mr. Post, Chief Engineer of the Netherland State Railroad, found that ties weighing 125 pounds laid in sand and gravel ballast had decreased 8¾ pounds in 35 years, but were still good for 20 years' service.

Not having begun the use of automatic signals, I have not made any test of insulation, but am advised that effective insulation can be made without impairing the connection between rail and tie.

Steel ties have been furnished to the supervisors and section foremen, and they have been asked to freely criticise them. Whereas they do not claim that steel ties perfectly meet all conditions, they want steel ties whenever they can be furnished.

We have stretches of track laid with all steel ties up to 4.4 miles in length, and find that after the track is filled with ballast there is a very appreciable reduction of noise in general and at the joints below what can be obtained with wooden tie track.

Take any period of five years and the Interstate reports show that tie renewals are from two to two and a half times the cost of the renewal of rails. On the assumption that the steel tie can be produced at the same price per pound as the steel rail, and that the life of the steel tie will be one and one-half times that of the steel rail, the cost of tie renewal would be about equal to that of rail renewal. Experience in Europe and observation from our own experience here indicates that a longer life will be obtained. The possible reduction of cost of tie renewals to the same cost as rail renewals shows the great economy obtainable from the use of steel ties. A portion of this reduction is due to being able to sell the old tie for scrap for 40% to 50% of its original cost.

I have attempted here to make a fair and simple statement of our experience, and will conclude with saying that we expect to continue the use of steel ties in maintenance and in new construction work on a still larger scale.

Personal

Mr. M. M. March has been appointed assistant engineer of the Cotton Belt & Northern Railway at Texarkana, Ark.

The office of Mr. W. J. Young, chief engineer of the Lehigh & New England, has been moved from Pen Argyl to Bethlehem, Pa.

Mr. Rudolph Wieser has been appointed chief engineer of the Vera Cruz Terminal Company at Vera Cruz, Mex.

Mr. J. W. Hunter has been appointed division engineer of the Evansville & Terre Haute at Evansville, Ind.

Mr. J. J. Gilligan has been appointed chief clerk in the office of Chief Engineer Richards of the Ann Arbor and Detroit Toledo & Ironton at Toledo, O.

Mr. R. D. Hall has resigned as assistant chief engineer of the Pittsburg Binghamton & Eastern to accept a position with a railroad in Florida.

Mr. J. B. Cameron, engineer of construction of the Alaska Central, has been appointed chief engineer, with headquarters at Seward, Alaska.

Mr. James F. Parr, assistant engineer of the Mississippi River & Bonne Terre, has resigned to become assistant engineer at East St. Louis, Ill.

Mr. T. Alexander has been appointed resident engineer of the Third district of the St. Louis & San Francisco at Cape Girardeau, Mo., in place of Mr. Herman Hall, transferred.

Mr. C. E. Crowley has resigned as assistant to the resident engineer of the Grand Trunk at Toronto, Ont.,

to accept a position with the Northern Railway of Costa Rica.

Mr. A. W. Peterson has been appointed general roadmaster of the International & Great Northern at Mart, Tex., in place of Mr. C. J. Rogan, resigned.

Mr. J. Krey, formerly division engineer of the Duluth Missabe & Northern, has been appointed division engineer of the Wisconsin Central at Duluth, Minn.

Mr. Russell L. Huntley, who has been acting chief engineer of the Union Pacific since November 10, 1905, has been appointed chief engineer of that system, with office at Omaha, Neb.

Mr. George E. MacFarland has been appointed assistant supervisor of signals of the Allegheny division of the Pennsylvania Railroad, with headquarters at Verona, Pa.

Mr. Leonard D. Smith has resigned as building supervisor of the Gulf Colorado & Santa Fe at Galveston, Tex., to engage in business at San Francisco, Cal.

Mr. J. A. Green has been appointed acting engineer of construction of the Chicago, Milwaukee & St. Paul of Montana and acting chief engineer of the Montana Railroad, with headquarters at Helena, Mont., owing to the illness of Mr. F. T. Robertson.

Mr. Herbert Wilgus, engineer of the Brooklyn Street Railway, has been appointed chief engineer of the Pittsburg Shawmut & Northern, with headquarters at Olean, N. Y., to succeed Mr. A. G. McComb, who has resigned to engage in the contracting business.

Mr. D. C. Holtsberry has been appointed supervisor of the Toledo & Ohio Central at Kenton, O., in place of Mr. E. Eberst, resigned. Mr. C. F. Michel has been appointed to succeed Mr. Holtsberry as supervisor at Bucyrus, O.

Mr. W. M. Vandersluis has been appointed signal engineer of the Cleveland Cincinnati Chicago & St. Louis and the Peoria & Eastern, with headquarters at Cincinnati, O., vice Mr. G. H. Macdonough, resigned; effective on Sept. 17.

Mr. G. H. Harris, heretofore division engineer of the Michigan Central at Niles, Mich., has been appointed assistant engineer at Detroit, Mich. Mr. C. C. Hill has has been appointed to succeed Mr. Harris at Niles.

Mr. W. S. Hanley has been appointed assistant engineer of the Chicago and Indiana divisions of the Chicago & Eastern Illinois, with office at Danville, Ill., in place of Mr. C. B. Randell, resigned.

Mr. E. M. Collins has resigned as chief engineer of the Quincy, Omaha & Kansas City owing to ill health. Mr. C. T. Brimson, heretofore assistant engineer, has been appointed to succed Mr. Collins as chief engineer, with headquarters at Kansas City, Mo.

Mr. F. F. Lloyd, formerly assistant and resident engineer of the western division of the Southern Pacific, is now chief engineer for the contracting firm of E. B. & A. L. Stone, 900 Broadway, Oakland, Cal.

Mr. George Crocker has been appointed division engineer of the Cleveland, Cincinnati, Chicago & St. Louis in charge of construction work on the Cincinnati division, with office at Middletown, O., vice Mr. P. H. Delano, resigned.

Mr. W. E. Dauchy, formerly chief engineer of the Chicago Rock Island & Pacific, and later division engineer of the Isthmian Canal in charge of the Culebra cut, has been appointed division engineer of the coast extension of the Chicago, Milwaukee & St. Paul in charge of the work in Idaho and Washington, with headquarters at Tekoa, Wash.

Mr. J. S. Barlow, heretofore assistant engineer in charge of construction of the Arizona Eastern, has been appointed assistant engineer in charge of the Yaqui River and Alamos branch lines of the Cananea Yaqui River & Pacific, with headquarters at Carral, Senora, Mex., to succeed Mr. O. C. Thompson, transferred.

Mr. E. D. Sabine has been appointed assistant engineer of the New York Central & Hudson River in charge of inspectors in the field of the Grand Central Terminal improvements, succeeding Mr. P. M. Corry, who has been appointed assistant engineer in charge of lines and grades in the field, Grand Central Terminal Improvements.

Mr. F. H. Mudge has resigned as bridge engineer of the Eastern Railway at New Mexico, the Santa Fe line under construction from Belen to Texico, N. Mex. Mr. Mudge has been with the Santa Fe system for twenty-four years and before becoming bridge engineer of the Eastern New Mexico, January 1, 1903, he was resident engineer at Pueblo, Colo.

Mr. W. B. Poland, Mem. Am. Soc. C. E., who recently resigned as general manager and chief engineer of the Alaska Central Railway, has been elected vice-president and chief engineer of the Philippine Railway Company, and will sail for Manila about November 1 to take charge of construction and other interests for the syndicate which is building railroads on the Islands of Panay, Negros and Cebu. His address will be 43 Exchange Place, New York, and Manila, P. I.

Mr. A. S. Zinn, who has been construction engineer on the Michigan Central at St. Thomas, Ontario, in charge of double track work between Detroit and Buffalo, has been appointed division engineer on the Isthmian Canal. He was formerly principal assistant engineer and division engineer on the Chicago, Rock Island & Pacific, and before going to the Michigan Central in April, 1906, was assistant engineer of the Chicago & Western Indiana, in charge of track elevation.

The American Institute of Social Service announces that it will hold an exposition of safety devices in New York City January 28 to February 9, 1907. Mr. Josiah Strong, 287 Fourth Ave., New York, is president.

Water Columns

The advance in watering and coaling locomotives is easily recognized by comparing the accompanying illustrations, Figures 1 and 2. Fig. 1 is an illustration of the locomotive of 1830, when they carried a barrel for water and a small box for coal. Fig. 2 is an illustration of the water and coaling station of the Baltimore & Ohio Railroad at Cincinnati, O.

Fig. 3 is an illustration of the latest and most improved style of water column. This is the Poage Style D water column, with the Fenner drop spout. The construction of the drop spout is extremely novel for its great flexibility. It has a range of adjustment in a perpendicular line with the discharge end always in the center of the track of five feet or more and a lateral movement of three feet or more according to the length of spout. It can be swung out or in, made longer or shorter, than its normal length to reach the center of track in case it is between tracks which are at different distances from column, two diverging tracks on the same side of column, or at an angle, avoiding the necessity of accurately spotting an engine.

The open joint of this spout not only gives a great range of adjustment, but prevents ice from forming in the joint, which is an important feature. They have been in use for two years in the northern part of the United States and in Canada and work without interference from ice.

The back end of spout at the joint is supported by a wheel running on a track and the discharge end by cables which are attached to a weight which holds the spout up when not in use. The parts are of the simplest construction and there is no packing or part that requires adjustment or repairs.

The valve rod is so fastened to the slotted casting upon which the ball weight rests, as to make it absolutely sure and positive. This rod passes through a stuffing box in the Tee and is enclosed in a pipe connecting with the brass dredge or drain which prevents ice forming around the rod.

The incline is a heavy cast iron collar which is secured to the vertical column with case-hardened set screws to support the weight. Its under surface is a double set of inclined planes, which travel on the bevel supporting rollers when the column is rotated; when the spout is parallel with the track, the supporting rollers are in the notches or deepest portions of the inclined planes. As the vertical column is rotated it is raised vertically, and raises the fulcrum to position for operating the lever. When the spout is released the weight of the column on this incline causes it to swing back to its normal position, parallel to the track. When in this position the fulcrum is lowered and the lever cannot be operated. When the location of the column is in the angle of intersecting tracks, the incline is made with one notch, thus throwing the spout clear of either track.

The valve chamber is made of heavy cast iron, and houses the main valve and automatic closing device. To avoid corrosion and to insure the greatest possible durability, all working parts are made of gun metal. Every part is accessible for renewing or repair by one man, quickly, and without having to raise the column or disturb any other part.

The main valve is cylindrical, evenly balanced and easily operated. It is packed with oak-tanned sole leather and seats on pure rubber, causing absolute stoppage of flow when valve is closed. The inlet channel and main valve are made with enlarged capacities, insuring full flow equal to the orifice of the discharge pipe.

The automatic closing device is enclosed in a compartment removed from the water that passes through the valve chamber, and is supplied with water that is freed from sand and grit by passing through a settling chamber. The water thus becomes a lubricant instead of a vehicle for grinding material to wear the parts. In extreme cold climates oil is used in the closing device to prevent freezing.

The closing device consists of a perforated gun metal cylinder in which is operated a disk piston attached to a rod or stem, and is so connected with the main valve as to have perfect control over its closing, thereby preventing any concussion in the pipes. This piston is provided with a governor which can be regulated to close the main valve in a given time, and cannot be hurried by the fireman jamming up the lever.

The valve chamber is provided with a waste valve which is operated by the stem of the main valve, automatically, to drain the column in winter and easily adjusted so as not to drain the column in summer. It has a leather packing to prevent the water from leaking out of the vertical column in summer, and for winter the leather can be removed by taking the cap off of the waste valve.

These columns are manufactured by the American Valve and Meter Co., of Cincinnati, Ohio.

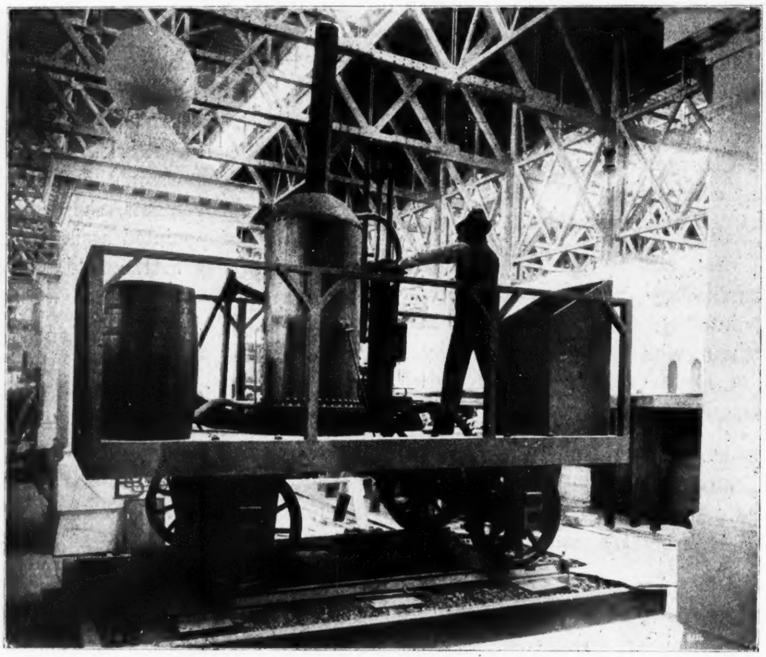


FIG. 1.—ILLUSTRATING OLD TIME FACILITIES.

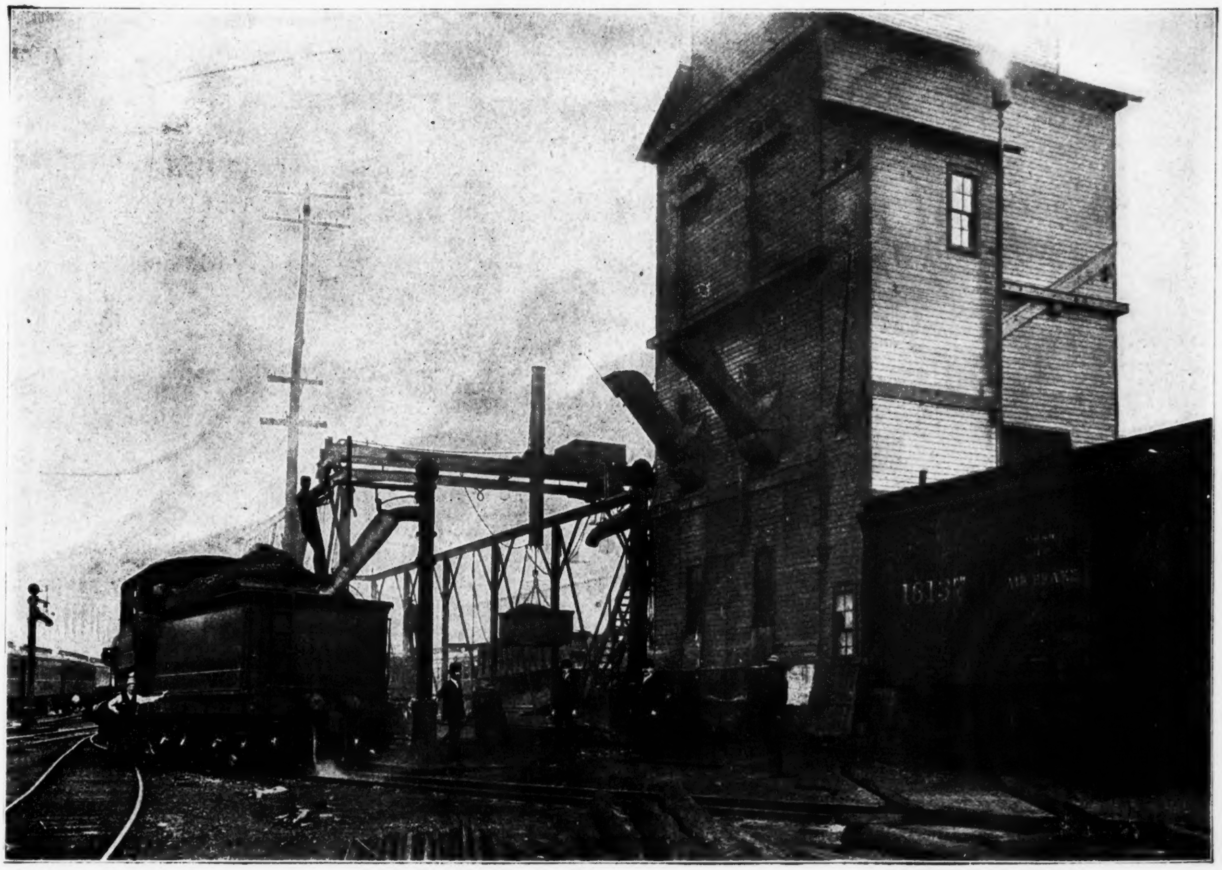


FIG. 2.—WATER AND COALING STATION ON BALTIMORE & OHIO RAILROAD AT CINCINNATI, O.—ILLUSTRATING MODERN FACILITIES.

FIG. 3.—IMPROVED POAGE WATER COLUMN.

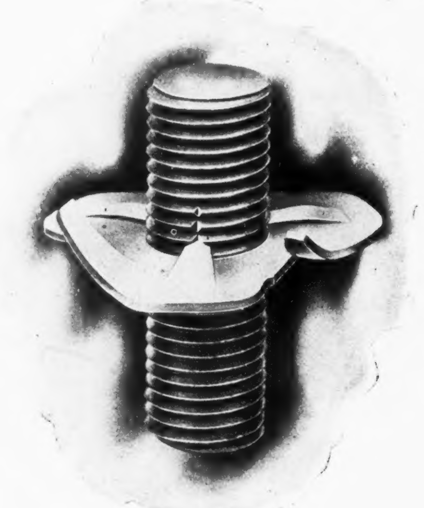
Book Review

Among the late technical books and especially those taking up the subject of Railway Engineering, is the work of Mr. F. Lavis, Assoc. M. Am. Soc. C. E., entitled "Railroad Location Surveys and Estimates." This book is quite noteworthy, due to its thoroughness and careful attention to the minutest details. One feature is brought out in a true light and which some of our best engineers are sometimes powerless to prevent, that is what is called "true economy." Engineering work involving many thousands and even millions of dollars is often delayed on account of the refusal of a twenty or thirty dollar requisition. Some locating engineers receive much larger pay than others, but it is because as a rule they will save twice the expense in their work that the less paid man is not able to do.

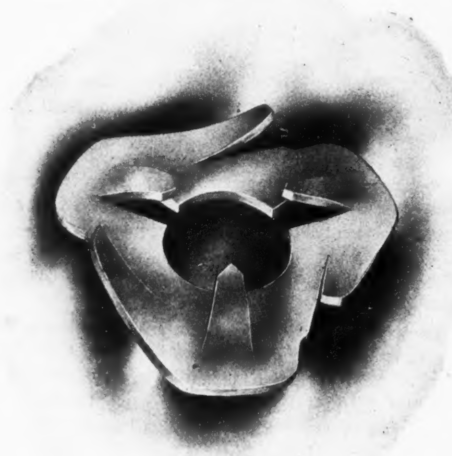
The following subjects are very ably worked out with careful attention to small details that are too often overlooked. Chapter I, Resume of Methods and Explanation of Terms; Chap. II, Reconnaissance; Chap. III, Organization and Equipment; Chap. IV, Preliminary Survey—Field Work; Chap. V, Maps and Office Work; Chap. VI, Location; Chap. VII, Suburban Rapid Transit Railways; Chap. VIII, Estimates and Tables of Quantities; Chap. IX, Surveys in Tropical Countries and Notes on Modifications of Organization and Equipment. Then follow various trigonometrical and curve formulae, tables of level cuttings, astronomical engineering, etc. It is a book that will undoubtedly be taken up as a text book among the leading engineering schools and is well worthy of the careful attention of any technical man. The book is the production of the Myron C. Clark Publishing Co., 13-21 Park Row, New York.

The Clark Automatic Nut-Lock

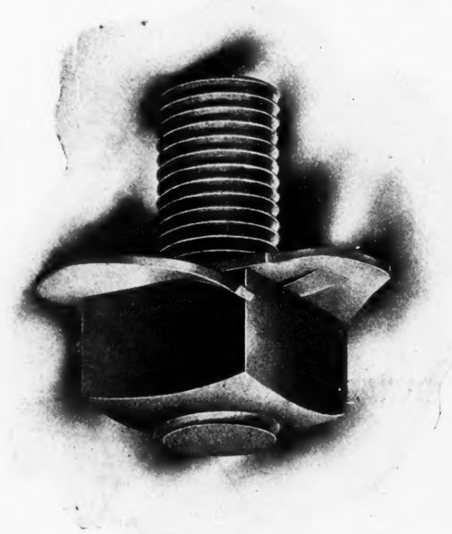
Nut locks—there are many of them on the market today, good, bad and indifferent. In all rail laying of the present day nut locks are used with scarcely any exception. However a close inspection several months later will find many loose nuts and especially those which have been protected with so-called "first class" nut locks. When a nut lock is finally found



that is effective it is generally too complicated and expensive for extensive use. The Clark Automatic Nut Lock is constructed in an extremely simple manner and on the "ratchet" principal. This allows but one direction for the nut to move and that is the proper one for tightening. The nut lock is of spring steel and is tempered. In operation the lock slips



onto the bolt like a common washer, with the prongs pointing outward towards the nut, then being screwed down on the bolt carries with it the 3 inner prongs which cut through the thread of the bolt (about one-half the depth of the thread) thereby fastening the lock to the bolt (fig. 1) and in being screwed down on the bolt the nut compresses and passes over the 3 outer prongs which spring back into their normal shape as the short diameter of the nut comes opposite to them, thereby preventing any backward movement of the nut (fig. 2). The nut lock is inexpensive and thoroughly practical for all



purposes. A number of these locks have just been placed on the Chicago & North Western R. R., Illinois Central, and C. R. I. & P. Ry. For further information and details apply to the Clark Automatic Nut Lock Co., 907 Security Bldg., Chicago, Ill.

Miscellany

A rust-proof tin cap is the latest device for getting a tight roof and it seems very practical. The ordinary cap furnished with ready roofings is made of tin scrap which usually rusts in a very short time. The outside is painted, but the inside will rust just as quick. Many roofs have failed because the tin caps rusted out. A patent on this new rust-proof cap has been granted to F. W. Bird & Son, East Walpole, Mass., th emakers of Paroid roofing. It is made of new sheet steel and has more binding surface than the ordinary round cap because it is square. This new cap is worth considering when you want to make sure of a right roof.

The Dayton Pneumatic Tool Co., Dayton, Ohio, at its annual meeting, on October 16, elected Wm. W. Price, president and treasurer; David O. Holbrook, vice-president; and F. W. Buchanan, secretary and general manager. The capacity of the "Dayton" hammer plant has been doubled within the past six months and the company states that it is now in a position to make prompt delivery on orders for any of its tools.

The Buda Foundry and Manufacturing Company of Chicago, et al, have instituted a suit for infringement against Cook's Railway Appliance Company. The trouble has grown out of the manufacture and sale by the Cook Company of a track drill, which is claimed to be a direct infringement of the patents on the Paulus drill made by the Buda Company. The Paulus track drill has been on the market for a number of years and is so largely used by the railroads through this and other countries that its advantages are probably familiar to every track man in the United States, at least.